



Kazuo OGURA, Dr. Sci.

Professor

Program: Electrical and Information Engineering

Area: Electrical and Electronic Engineering

Undergraduate: Dept. of Electrical and Electronic Engineering

Professional Expertise

His professional expertise includes high-power electromagnetic wave sources, plasma waves, plasma applications, pulsed power technologies. The electromagnetic wave sources and technologies up to millimeter and submillimeter waves or terahertz waves are developed. Electron beam sources in a weakly relativistic region based on compact pulsed power technologies and electric power engineering are also included.

Research Fields of Interest

Electromagnetic Wave Sources up to Terahertz Wave Regions

High-power electromagnetic wave sources up to terahertz wave utilizing electron beams such as BWO, surface wave oscillator, Smith-Parcell FEL are studied. The electromagnetic wave sources are based on the slow cyclotron interaction at the anomalous Doppler-shifted frequency and the Cherenkov interaction. To increase the power handling capability and the operation frequency up to terahertz wave regions, oversized slow-wave structures are used for excitations of surface waves and stimulated Smith-Purcell radiations. To analyze beam interactions with electromagnetic waves, new versions of the self-consistent relativistic field theory considering three-dimensional beam perturbations are developed.

Pulsed Power Systems and Electron Beam Sources

We develop compact high-voltage pulsed power systems and electron beam sources to generate uniform sheet and annular electron beams in the weakly relativistic region less than 100 kV. A new cold cathode is proposed to obtain a weakly relativistic electron beam and the surface conditions of the cathode are examined using surface analyzing system with digital microscope. With our new cold cathode, the stable generations of uniform electron beams in sheet and annular shapes are experimentally demonstrated.

Atmospheric Pressure Plasma and Plasma Application

Atmospheric pressure plasmas are generated by applying RF high voltages. Plasmas in a form of bullet are released as a plume into the atmosphere. Characteristics of the plasmas and their applications are studied. High-energy electrons are produced by injecting microwave powers into magnetically confined plasmas and their velocity distribution functions as well as their spatial profiles are examined by several types of x-ray diagnostics, such as x-ray energy spectrum analyses, x-ray absorption methods, and x-ray tomographic reconstructions using various types of x-ray detectors.

Education

1989: Doctoral Sci. degree, Kyoto University, Japan
1983: Master Sci. degree, Kyoto University, Japan
1981: Bachelor Sci. degree, Okayama University, Japan

Professional Societies and Activities

1. Member, The Physical Society of Japan (PSJ)
2. Member, The Japan Society of Plasma Science and Nuclear Fusion Research (JSPF)
3. Member, The Institute of Electrical Engineering of Japan (IEEJ)
4. Member, IEEE

Awards

1. The Sir Thomas Ward Memorial Medal, the Institute of Engineers, India, Jan. 2000.

Major Publications

Papers

- [1] "Beam Interactions with Surface Waves and Higher Order Modes in Oversized G-band Slow-Wave Structure", IEEE Transactions on Plasma Science, Vol.44, pp.201-210, 2016.
- [2] "Dependence of Plasma Plume Formation on Applied Voltage Waveform in Atmospheric Pressure Plasma", IEEE Transactions on Plasma Science, Vol.44, pp.107-112, 2016.
- [3] "Oscillation-Starting Conditions for Oversized G-Band (140-220 GHz) Backward Wave Oscillator Driven by Weakly Relativistic Electron Beam", IEEE Transactions on Plasma Science, Vol.43, pp.3530-3536, 2015.
- [4] "Experimental Study of Intense Radiation in Terahertz Region based on Cylindrical Surface Wave Resonator", Journal of Applied Physics, Vol. 118, 1231010, 2015.
- [5] "Influence of flowing helium gas on plasma plume formation in atmospheric pressure plasma", Physics of Plasmas, Vol. 22, 053513, 2015.
- [6] "Beam Interactions with Surface Waves and Higher Order Modes in Oversized Backward Wave Oscillators", Journal of the Korean Physical Society, Vol.65, pp.1209-1214, 2014.
- [7] "Experimental Study on Smith-Purcell Radiations of Weakly Relativistic Oversized Backward Wave Oscillators", Journal of the Korean Physical Society, Vol.65, pp.1196-1200, 2014.
- [8] "Experimental Study on G-band Oversized Backward Wave Oscillator Driven by Weakly Relativistic Electron Beam", Plasma and Fusion Research, Vol.9, 3406032, 2014.
- [9] "Normal Modes and Slow-Wave Instabilities in Oversized Coaxial Slow-Wave Structure with Rectangular Corrugations", IEEE Transactions on Plasma Science, Vol.41, pp.2729-2734, 2013.
- [10] "Experimental Study on Generation of Electron Beam Utilizing Cold Cathode in the Weakly Relativistic Energy Region", IEEE Transactions on Plasma Science, Vol.41, pp.2781-2785, 2013.
- [11] "Temporal Growth Study in Trapezoidally Corrugated Slow-Wave Structure for Backward-Wave Oscillator", IEEE Transactions on Plasma Science, Vol.41, pp.2257-2263, 2013.
- [12] "Higher Order Mode Radiations of Weakly Relativistic Oversized Backward Wave Oscillator", Plasma and Fusion Research, Vol.8, 2401085, 2013.
- [13] "Smith-Purcell Radiation Based on Cylindrical Surface Waves", Fusion Science and Technology, Vol.63, pp.259-261, 2013.
- [14] "Cylindrical Surface Wave and Slow-Wave Instabilities of Periodically Corrugated Cylinder", Fusion Science and Technology, Vol.63, pp.152-155, 2013.
- [15] "Cylindrical Surface Wave on Periodically Corrugated Metal Cylinder", Plasma and Fusion Research, Vol.7, 2406022, 2012.
- [16] "Experimental Study on Weakly Relativistic Oversized Backward Wave Oscillator with Coaxial Rectangular Corrugations", Journal of the Korean Physical Society, Vol.59, pp.3573-3577, 2011.
- [17] "Numerical Study of Slow-wave Instabilities in an Oversized Coaxial Slow-wave Structure", Journal of the Korean Physical Society, Vol.59, pp.3555-3559, 2011.
- [18] "Experimental Study on Backward Wave Oscillation Based on Cylindrical Surface Wave of Smith-Purcell Free Electron Laser" Plasma and Fusion Research, Vol.6, 2401039, 2011.
- [19] "Experimental Study on Disk Type Cold Cathode in Weakly Relativistic Energy Region" Journal of Plasma and Fusion Research Series, Vol.8, pp.1477-1482, 2009.
- [20] "Studies of a Weakly Relativistic Oversized Backward Wave Oscillator with Disk Cathode and Rectangular Corrugation" IEEJ Transactions on Fundamentals and Materials, Vol.127, pp. 681-686, 2007.
- [21] "Improved Performance of Oversized Backward Wave Oscillator driven by Weakly Relativistic Electron Beam" Fusion Science and Technology, Vol.51, pp.325-327, 2007.
- [22] "Slow Cyclotron and Cherenkov Instabilities in Weakly Relativistic Oversized Backward Wave Oscillator", Fusion Science and Technology, Vol.51, pp.331-333, 2007.
- [23] "Cherenkov Instability due to Unmagnetized Electron Beam in Periodically Corrugated Waveguide" Japanese Journal of Applied Physics, Vol.42, pp.7095-7103, 2003.
- [24] "Self-Consistent Linear Analysis of Slow Cyclotron and Cherenkov Instabilities" Physical Review E, Vol.63, 056503, 2001.